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Title: ROLLER CONVEYOR DRIVE ;

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Equivalents: ;

ABSTRACT:

A powered roller conveyor comprises a plurality of rollers (6) driven by belts (5) from a drive shaft (3). A bearing insert (8) in each end of the roller has a spindle (13) extending therethrough, at least one end of said spindle being provided with flats engaging slots (21) formed in side members (1). Integral with said insert (8) is an axially extending sleeve of which the free end is threaded to accept a nut (11). A pulley (9) is mounted on the sleeve and a compression spring (10) located between said nut and said pulley presses the pulley against the insert (8), the axial loading between them being adjustable by rotation of the nut. The slipping drive provided by the above-described arrangement may be provided, in an alternative, by mounting the pulley and adjustable loading means on the drive shaft.

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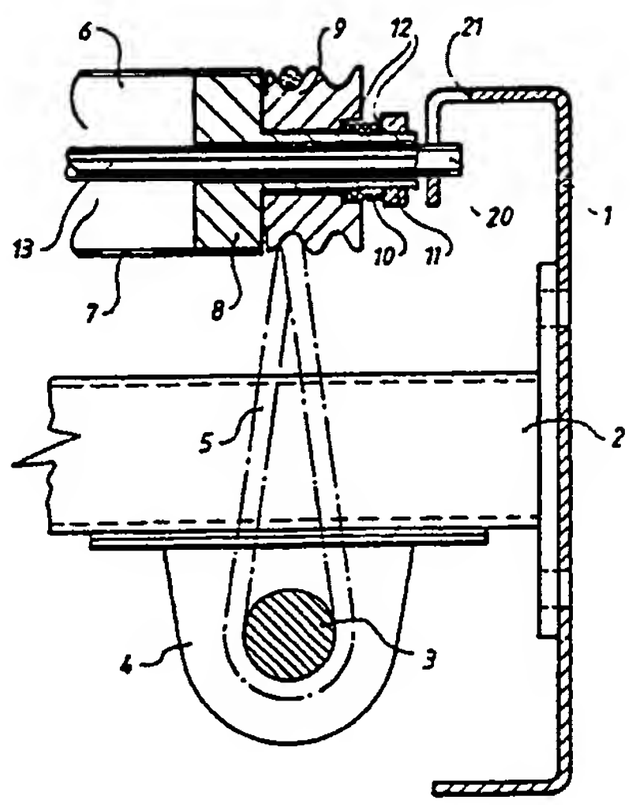
(54) Roller conveyor drive

(57) A powered roller conveyor comprises a plurality of rollers (6) driven by belts (5) from a drive shaft (3). A bearing insert (8) in each end of the roller has a spindle (13) extending therethrough, at least one end of said spindle being provided with flats engaging slots (21) formed in side members (1).

Integral with said insert (8) is an axially extending sleeve of which the free end is threaded to accept a nut (11). A pulley (9) is mounted on the sleeve and a compression spring (10) located between said nut and said pulley presses the pulley against the insert (8), the axial loading between them being adjustable by rotation of the nut.

The slipping drive provided by the above-described arrangement may be provided, in an alternative, by mounting the pulley and adjustable loading means on the drive shaft.

Fig 2.



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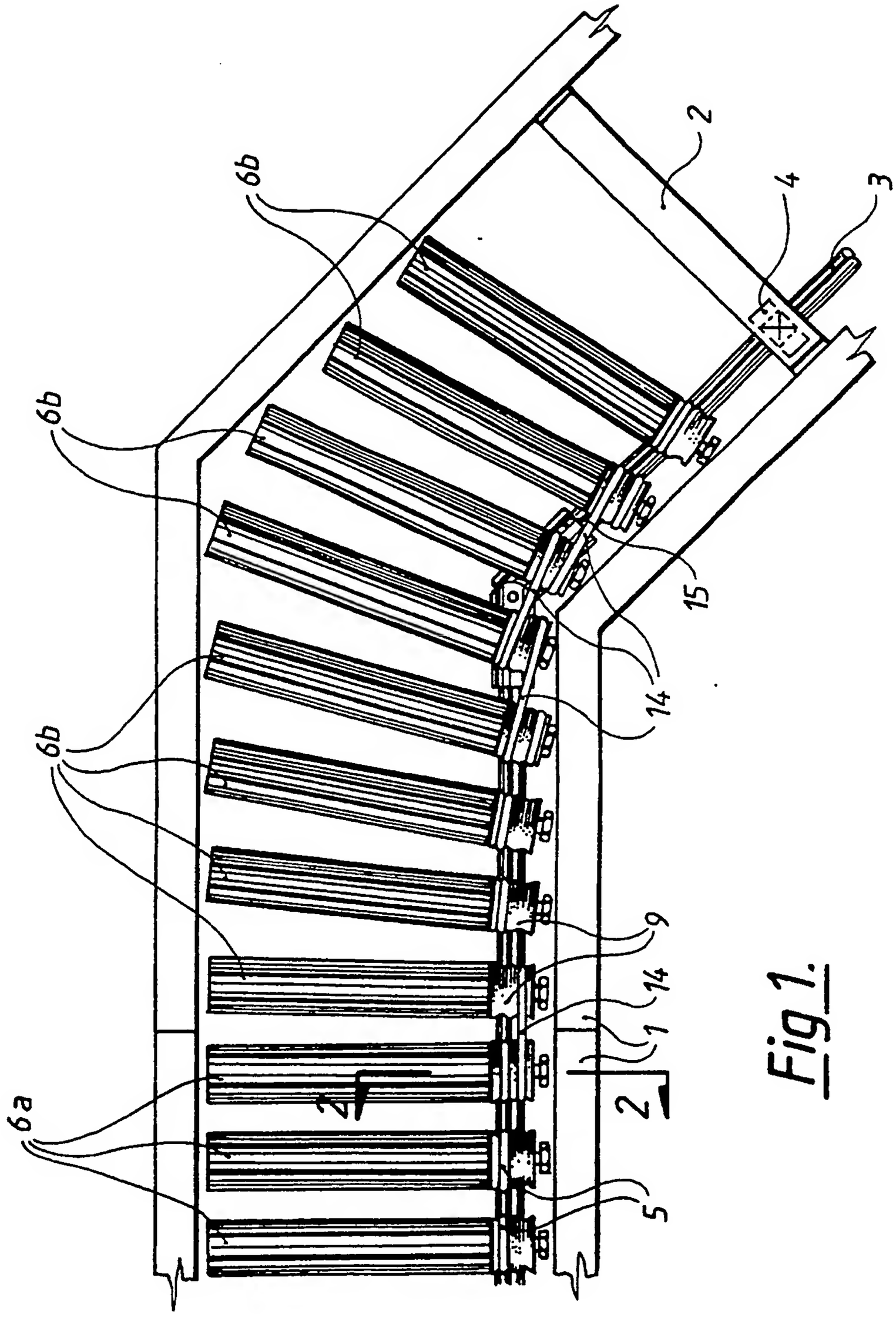

Fig 1.

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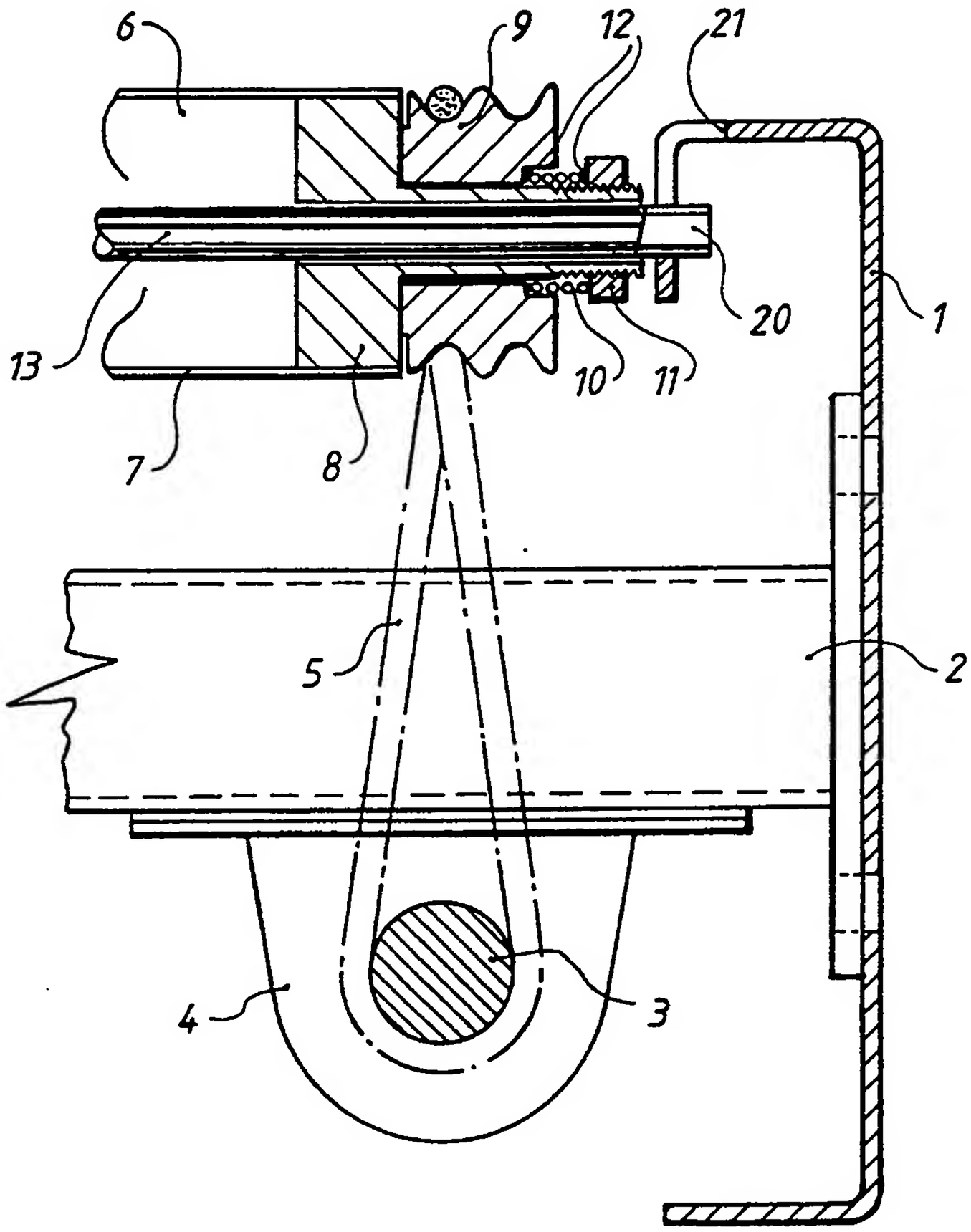
Fig 2.



Section '2-2'

CONVEYORS

This invention relates to conveyors of the kind having a plurality of load carrying rollers arranged to form a path of movement for an article riding on the roller peripheries, the axes of the tollers lying transversely of said path, and at least some of the rollers being rotatably driven to effect or control the movement of the article or articles. Conveyors of this kind are hereinafter referred to as 'powered roller conveyors'.

For some applications it is desirable that the rollers are not postively driven; instead the tractive effort applied by the roller periphery is limited by a slipping drive to a predetermined torque level. Thus, for example, if passage of articles along the path is obstructed or they are deliberately held for some process to be carried out at a work station or the like, the relevant rollers will be halted or slowed automatically without affecting the drive applied to other rollers in the path. In this way, accumulation of articles in certain zones of the path can be provided for safely and without risk of damage.

One known form of slipping drive uses a powered line drive shaft extending along the length of the conveyor and connected individually to the driven rollers by short flexible belt loops or bands, the

roller peripheries including grooves acting as driven pulleys engaged by the bands and the drive shaft being provided with respective drive pulleys which are loose on said shaft, the bands being twisted through 90° as the shaft and roller axes will be substantially normal to each other. The bands are formed of elastomeric material and are tensioned to apply sufficient friction, by the radial loading between each drive pulley and the shaft, to provide a predetermined maximum tractive effort at the respective roller; however, if the loading on the roller is sufficient to overcome that effort, e.g. due to an article being checked, the drive pulley will slip on the shaft.

Another form of slipping drive is described and claimed in British Patent 2074119 to which reference is made for further details. This arrangement provides a loose driven pulley on a spindle of each driven roller to which radial loading is applied by the band tension, so that the drive slippage takes place at the roller instead of at the line drive shaft.

While these arrangements have proved successful in practice, they have disadvantages in that the driving force transmitted is determined almost entirely by the effective in-service tensioning of the driving bands. Not only is this subject to variation due to inconsistencies in the manufactured properties of the bands and/

or stretching or wear thereof, but it is also difficult if not impossible to provide for simple adjustment thereof as the only way this can be effected is by altering the spacing between the roller and drive shaft axes.

The object of the invention is to provide powered roller conveyors having a slipping drive which is readily and simply adjustable and which permits the maximum tractive effort of each driven roller to be individually and positively selected and varied over a wide range.

According to the invention, there is provided a powered roller conveyor having a plurality of operatively driven load carrying rollers, powered rotary drive input means, and drive transmission means respective to each said roller drivingly connecting the latter to the input means, each said transmission means including first and second drive formations mounted co-axially, resilient loading means urging the formations into axial engagement with each other, whereby an operatively predetermined maximum driving torque is transmitted from the input means to the respective roller, and means for selective adjustment of the loading means for variation of said maximum torque.

Conveniently each drive transmission means includes a flexible drive loop or band, one of the drive forma-

tions being a pulley with which said loop or band is engaged. Said pulley may be mounted on a spindle of the roller, conveniently but not essentially at one end thereof, the other drive formation being an end or other radial face of the roller against which the pulley is axially urged; or said pulley may be mounted on a powered line shaft constituting the drive input means.

In another arrangement, for example where powered rollers have their axes disposed radially about a common centre so that they are in non-parallel relationship to provide a curved path, said pulley may be associated with a first roller to form a driving connection between that and a second adjacent roller by means of a flexible band or loop and the pulley may be adapted to accommodate more than one drive loop or band for this purpose.

Conveniently, the resilient loading means is a compression spring mounted co-axially with the elements and the selective adjustment means is a threaded element for selective adjustment of the spring compression.

An embodiment of the invention is now more particularly described with reference to the accompanying drawings wherein:-

Figure 1 is a diagrammatic plan view of part of a powered roller conveyor; and

Figure 2 is a vertical sectional view on line 2-2

of Figure 1.

The conveyor may be of any length and may include straight or curved portions; for illustration, part only of a straight and curved portion is shown in Figure 1. It consists of a plurality of load-carrying rollers 6 of which those 6a in the straight section have spaced parallel axes while the others shown, 6b, have their axes disposed radially around the curve. In this particular example, each of the rollers is driven in the manner described hereinafter though it is to be understood that, for some applications, idler or non-driven rollers might be included.

Each roller comprises a cylindrical metal (or other suitable material) tube or shell 7 forming the roller periphery and having a plastic bearing insert 8 (one only shown) in each end. Passing through the bearing inserts are respective spindles 13 which are located in parallel side members 1 of the conveyor.

Side members 1 are formed to channel type sections shown in Figure 2 and are connected by cross members 2 which mount bearings 4 as shown in which a powered line drive shaft 3 is journalled. This shaft extends longitudinally of the straight sections of the conveyor spaced below and adjacent to one end of the set of rollers 6.

The roller spindles 13 adjacent shaft 3 are

elongated and mount a first drive formation in the form of a plastics double-grooved pulley 9.

Pulley 9 is loose on Bearing insert 8 and its overall diameter is substantially the same or slightly less than that of the roller 6; one axial end face of pulley 9 abuts the outer axial end face of the roller bearing insert 8 which serves as a second drive formation.

Said formations are urged into axial engagement, by a compression spring 10 mounted between two washers 12, with Bearing insert 8, the compression of this spring being adjusted by means of a nut 11 engaged with a threaded portion of the Bearing insert 8.

Drive shaft 3 carries a respective drive band 5 for each of the rollers 6 in the straight sections. Each drive band 5 formed of endless round section tough elastomeric material is twisted through 90^{o} and connected to the associated loose pulley 9 of the roller. The torque transmitted to the roller by band 5 by rotation of drive shaft 3 provides tractive effort at the roller periphery limited by the frictional engagement under predetermined axial loading between pulley 9 and the end face of insert 8. This can be closely and accurately pre-selected or adjusted by varying the compression of spring 10 by means of nut 11 without having to dismantle the roller and without affecting or

having to alter the drive loop tension or spacing between axes of shaft 3 and the roller.

The range of adjustment provided can be from practically zero torque, leaving the roller free to rotate or not almost independently of the drive being applied to pulley 9, up to an almost 'solid' or positive transmission at which no slipping of the drive is possible and the torque is only limited by the friction of the drive loop 5 itself or the power available.

It will be appreciated that each roller can be very easily individually adjusted through this wide range so that the conveying action of rollers in different sections of the conveyor can be readily varied, e.g. to give high tractive effort in some areas and low or almost non-existent tractive effort in other areas, for example to allow holding back or accumulation of articles on the conveyor without jamming or damage. Furthermore, the torque setting is not affected by wear or stretching of the drive loop and does not in any way depend on the tensioning of the latter; indeed, it is found that the drive loops can be run relatively slack while still being capable of transmitting full power so considerably reducing wear on bearings, extending belt loop life, and giving much improved safety in that obstruction or entanglement with the loop or pulleys is

unlikely to result in any serious damage or injury.

Preferably, pulley 9 and insert 8 are formed from different plastics materials having characteristics facilitating the necessary frictional drive, for example an acetyl plastics and a polyamide plastics ('nylon') though other materials could be employed. For some applications, a friction disc or washer may be interposed between pulley 9 and the roller end, e.g. of metal or of a high-friction material as used for brake or clutch linings where heavy duty drive is required.

The rollers 6 may be formed from various materials and/or provided with various kinds of peripheral surfacing, e.g. rubber, plastics, or wood. The rollers are cheap to produce due to the absence of any internal precision bearings within the roller.

Preferably, but not essentially, the centre line of shaft 3 is slightly offset towards the centre of the conveyor relative to the centre line of the pulley groove with which loop 5 is engaged so that the action of the latter urges pulley 9 axially inwards in the same direction as the action of spring 10.

In the arrangement shown in Figure 1, the drive shaft 3 is arranged around the curve and journalled, by suitable positioning of hearings 4. The shaft ends are connected by universal type joints 15 to enable the drive shaft 3 to follow a similar path as side

member 1 and in so doing provide a suitable position for driving radially positioned rollers mounted above. In some cases however it may not be possible to drive each roller directly from the lineshaft 3 via band 5 due to a space created by the prescence of bearing unit 4 or universal coupling 15, etc., along the drive shaft 3 in which case the double grooved pulley 9 can be interconnected to transmit drive to an adjacent roller or rollers by endless bands or loops 14.

The setting for the individual rollers indirectly driven from adjacent roller pulleys can be individually selected or adjusted just as in the case of those individually driven from the line shaft.

Drive to some rollers can be reversed by twisting loop 5 in the opposite direction and, if so required, the torque setting of such reverse driven rollers can even be made high enough to brake fast-moving articles, hold them approximately stationary, or even drive them back down the line.

The slotted spindle locations in side members 1 enable Rollers 6 to be readily accessible for inspection and maintenance and easily replaced if necessary without wholesale dismantling. For some applications, precision low friction bearings, e.g. ball or roller bearings may be internally fitted within insert 8 but it is anticipated that in most cases the much cheaper moulded

plastics bearing blocks 8 will be preferred.

The rollers and drive pulleys 9 can readily be dismantled and re-assembled for maintenance or cleaning and this is one reason for preferring to have the drive pulleys at the ends of the rollers. However, for some applications it is anticipated that a slipping drive pulley of the kind described might be provided at an intermediate position along the roller length between two parts of the roller, or that such a slipping pulley could be provided respective to each roller on the line shaft 3 the drive being transmitted to a fixed pulley on the roller or even a drive formation integral therewith for example a groove in the roller periphery itself.

While the drive band 5 has been shown engaged directly about the cylindrical periphery of shaft 3, it may be preferable to fit a fixed pulley director to drive shaft 3 to enable the band 5 to be positively located along drive shaft 3. although it is anticipated that in most cases the direct contact of the band 5 with shaft 3 will be suitable.

The bearing 4 supporting and locating the line shaft 3 would be mounted on individual cross members extending between the side members. This enables their lateral positioning to be chosen as required to align shaft 3 with the roller pulleys 9. As mentioned above, the latter need not be at the ends of the rollers but may

be in some intermediate position along the rollers.

Finally, it is to be noted that as the operation of the invention is not dependant on drive belt, band or loop tensioning, i.e. the application of a radial force giving frictional engagement between a pulley and its shaft, the use of elastomeric flexible belt drive is not essential; the invention can be applied to conveyors having other forms of drive transmission means, for example toothed belt or sprocket and chain drive or even possibly geared or like transmissions with the controlled torque or slippage provided between respective first and second drive formations of the drive train individual to each driven roller.

To reduce the overall length of the assembly, spring 10 and the inner one of washers 12 could be further accommodated within a greater axial recess in the outer end of pulley 9. Other forms of resilient means could be employed to provide the axial loading, for example Belville washers or a block or pad of elastomeric material.

It is necessary to point out that, unlike the rollers employed in the converyor disclosed and claimed in the Specification of said Patent No.2,074,119B, the rollers which have been described in the present Specification are not of conventional construction in that there are no spring-loaded spindles. Such spindles

have been replaced by the spindles 13 each of which extends right through the roller and which has flats 20 (only one shown in Figure 2) which enable that end of the spindle to be dropped into one of the spaced vertical slots 21 which are formed in the side members 1. In the case of rollers 6a (Figure 1) both ends of the spindle have flats 20 on opposite sides but, for the rollers 6b, one end of the spindle has said flats and the other end does not have any flats.

CLAIMS:

1. A powered roller conveyor having a plurality of operatively driven load-carrying rollers, powered rotary drive input means, and drive transmission means respective to each said roller drivingly connecting the latter to the input means, each said transmission means including first and second drive formations mounted co-axially, resilient loading means urging the formations into axial engagement with each other whereby an operatively predetermined maximum driving torque is transmitted from the input means to the respective roller, and means for selective adjustment of the loading means for variation of said maximum torque.

2. A powered roller conveyor as claimed in Claim 1, wherein each drive transmission means includes a flexible drive loop or band, one of the drive formations being a pulley with which said loop or band is engaged.

3. A powered roller conveyor as claimed in Claim 2, wherein said pulley is mounted on a spindle of the roller, the other drive formation being an end or other radial face of the roller against which the pulley is axially urged.

4. A powered roller conveyor as claimed in Claim 3, wherein said pulley is mounted in the vicinity of

one end of the spindle.

5. A powered roller conveyor as claimed in Claim 2, wherein said pulley is mounted on a powered line shaft which constitutes the drive input means.

6. A powered roller conveyor as claimed in Claim 5, wherein said flexible drive loop or band extends between said pulley on the line shaft and a fixed pulley on the roller.

7. A powered roller conveyor as claimed in Claim 5, wherein said flexible drive loop or band extends between said pulley on the line shaft and a groove in the roller periphery.

8. A powered roller conveyor as claimed in any one of the preceding Claims, wherein there are powered rollers which have their axes disposed radially about a common centre so that they are in non-parallel relationship to provide a curved path, said flexible drive loop or band extending directly from the pulley of one roller to the pulley of an adjacent roller, and the pulley being adapted to accommodate more than one drive loop or band for this purpose.

9. A powered roller conveyor as claimed in any one of the preceding Claims, wherein the resilient loading means is a compression spring mounted co-axially with the elements and the selective adjustment

means is a threaded element for selective adjustment of the spring compression.

10. A powered roller conveyor as claimed in Claim 3 or in any other Claim which is appended to Claim 3, wherein the spindle is not spring-loaded and wherein said spindle extends through the roller, the opposite ends of the spindle engaging parallel side members of said conveyor.

11. A powered roller conveyor as claimed in Claim 10, wherein both ends of some of the spindles have diametrically opposed flats thereon whereas others of the spindles have such flats on only one end thereof.

12. A powered roller conveyor constructed, arranged and adapted to operate substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

13. Any features of novelty, taken singly or in combination, of the embodiments of the invention hereinbefore described with reference to the accompanying drawings.

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